



Environmental Remediation Sciences

2004 NABIR PI Workshop

Teresa Fryberger
DOE/SC/OBER



Welcome!!!



Big changes in Environmental Remediation Sciences

- Goodbye! Congratulations! and Thank You! to **Anna Palmisano**
- Thank you! to Paul Bayer for carrying the torch and doing three instead of two jobs.
- Welcome! to Mike Kuperberg



ERSD Staffing

- Teresa Fryberger, Director
- Roland Hirsch, EMSP
- Paul Bayer, NABIR, Facilities, FRC....
- Mike Kuperberg, SREL, NABIR,
- **Coming soon**
 - Microbiologist/Environmental Engineer (permanent)
 - Biogeochemist/Soil Scientist (IPA)
 - Actinide/Physical Chemist (Detaillee)



ERSD Budget

| | FY04* | FY05* |
|--------------|------------------|------------------|
| NABIR | \$24,097 | 24,097 |
| EMSP | \$29,246 | 27,251 |
| EMSL | \$37,149 | 37,138 |
| SREL | \$ 7,776 | \$7,776 |
| <u>Misc.</u> | <u>\$10,932</u> | <u>\$9,260</u> |
| Total | \$109,200 | \$105,522 |

***President's budget request in thousands of dollars**



ERSD BERAC Subcommittee

Dr. Michelle S. Broido, Chairman,
BERAC Member, Associate Vice Chancellor,
Office of Research, Health Sciences, University of
Pittsburgh

Dr. Jillian Banfield
Department of Earth and Planetary Science
University of California, Berkeley

Dr. Margaret Cavanaugh
Office of the Director
National Science Foundation

Dr. Sue Clark
Department of Chemistry
Washington State University

Dr. Kenneth Eggert
Fluid Dynamics Group T-3, Theoretical Division
Los Alamos National Laboratory

Dr. Louis F. Pitelka, BERAC Member,
Director and Professor
Appalachian Laboratory, Univ. of Maryland

Dr. Mark Rivers
Associate Director / GSECARS
University of Chicago

Dr. James M. Tiedje, BERAC Member
Director, The Center for Microbial Ecology
Michigan State University

Dr. Andrew F. B. Tompson
Environmental Science Division, L-208
Lawrence Livermore National Laboratory

Dr. Samuel J. Traina
Director, Sierra Nevada Research Institute
University of California, Merced



Two new environmental members of BERAC!!!!

ERSD Subcommittee Reports

- Report on needs for Field Sites and other Facilities
- Review of Mesoscale Research and Facilities at INL
- To be reported on at April BERAC



Collaborations

- DOE: Environmental Management, Office of Civilian Waste Management
- NSF: Environmental Molecular Sciences Institutes
- EPA: Environmental Biotechnology
- Intergovernmental Steering Committee on Multimedia Modeling
- Federal Agency Chemistry Group
- Chemical Sciences Roundtable
- 3 Interagency Working Groups at OSTP



Strategic Planning/New Directions



ERSD Mission

...Advance the fundamental science leading to solutions to **currently intractable environmental problems** or to **break-through strategies** for remediation of the DOE sites and other DOE environmental and energy missions.



Hanford High Level Tank Wastes



Issues

- *Waste characterization*
- *Waste Treatment/Disposal*
- *Tank Corrosion*
- *Contaminant transport in the subsurface*
- *Characterization and monitoring in the subsurface*

Single Shell Tanks

- 35M gallons of wastes
- 132 Mcuries of radioactivity
- 149 tanks
- 190K tons of chemicals
- 75% Sr-90, 24% Cs-137
- 65 "leakers"



Paradigms for DOE Cleanup

- OLD: Cleanup standards based on a future use scenario of houses built, people living on DOE sites
- NEW: “Risk-based Endpoints” New land use scenarios –e.g. Rocky Flats will soon be a wildlife refuge

What does this mean?? Natural attenuation is now an accepted option for dispersed plumes vs. digging up and moving dirt.



It Is Clear That We Won't Be Able to Remove All Contamination at All Sites

- *We must understand what contaminants are mobile and under what conditions*
 - To develop science-based risk evaluations for better decision making
 - To develop effective remediation/containment strategies
 - To understand what/when/where to monitor at sites that will go into “long-term stewardship”



ERSD Scientific Goals

- Provide the scientific foundation for the development of robust tools for *in situ* characterization & long-term monitoring.
- Develop an improved understanding of contaminant fate & transport in subsurface & surface environments, including the role of microbes & plant life.
- Provide the scientific foundation to enable *in situ* control or remediation of hazardous materials in the environment or other contaminated media.
- Support basic research leading to safe management, treatment, and disposal of complex radioactive wastes



Recent Events/Highlights



Genomics-GTL Planning Study

- Early March 2004
- Initial effort in development of a roadmap for the “Genomics – GTL” program
- ERSD leading development of bio restoration chapter
- Goal - define a role for Genomics-GTL in shaping bio restoration development
- Process – draft roadmap in 12 months
- Co-chairs - H Bolton and M Hochela





- Organizers, J. Zachara, J. Fredrickson
- Workshop - November 2003,
- report release February 2004 (ERSD website, publications tab)
- “Earth-Life Interaction at the Microbe-Mineral Interface”
- Topics identified
 - Influence of bacteria on electron flux between cells and solids, and bacterial interactions with microenvironments
 - Interplay between microorganisms minerals





Environmental Molecular Science Institutes

- “..increase our fundamental, molecular-level understanding of natural and anthropogenic processes in the environment”
- Collaborative interdisciplinary research
- Formal partnerships among universities, national laboratories, industries and international institutions
- NSF funds universities/non-profits, multi-year grants
- DOE/SC expects to support some national laboratory collaborations
- Deadline was 3/8/04
 - 30 proposals (all from universities, many with NL partners)



Additional Field Research Centers

- ORNL FRC model has been successful
- ERSD plans a call for additional FRC(s) in FY04 (for FY05 funding)
- Emphasis will be on:
 - diverse and representative climatological & hydrogeological features
 - well-characterized site(s) with existing infrastructure





Research Highlights

- TIGR & UMass
 - Published the genome sequence for *Geobacter* (Science, 12/12/03)
- UMass, PNNL & UT
 - Field demonstration of U immobilization at Old Rifle UMTRA site (Science Update, 10/13/03)
- Harvard, WSU & Politecnico di Milano
 - Single-molecule fluorescence spectroscopy reveals rapid conformational fluctuations of flavin reductase (Science, 10/12/03)



Recognitions

- NABIR highlighted at 2003 ASM meeting
- Jim Tiedje elected to the National Academy of Science (April 2003)
- Derek Lovely to receive the Applied and Environmental Award at 2004 ASM meeting



Media attention

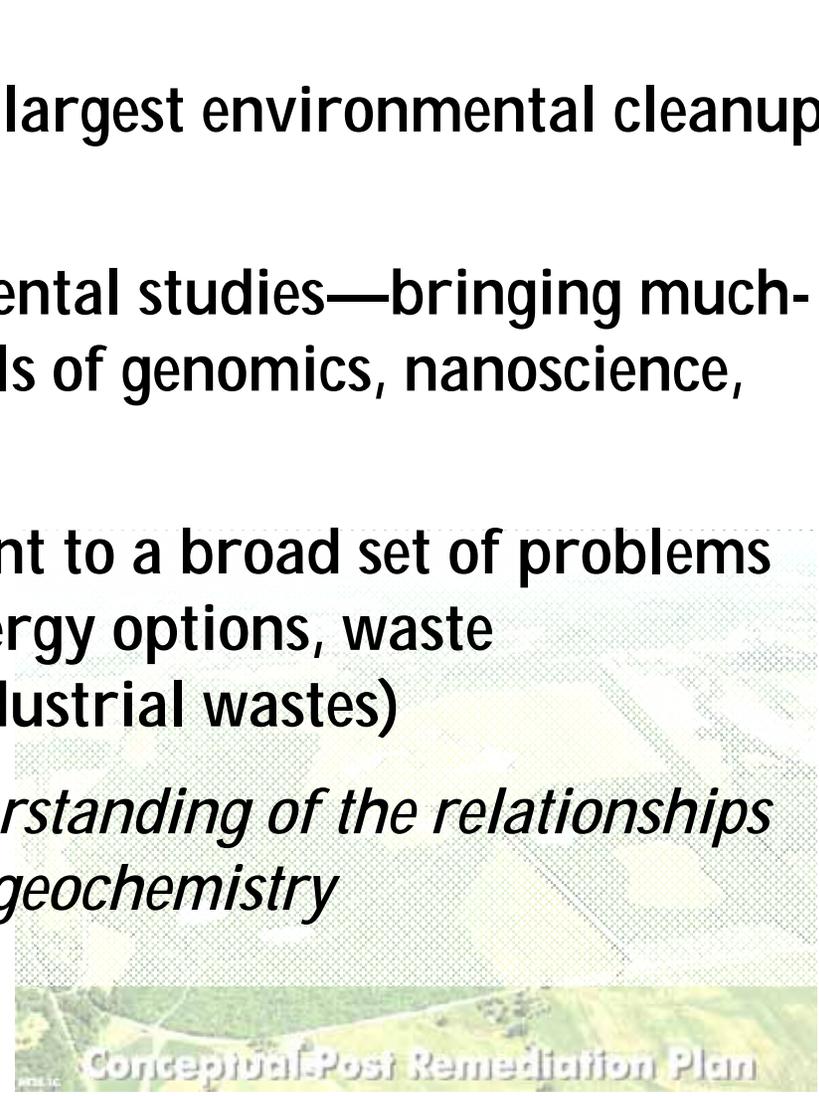
- UMass/Derek Lovely
 - NPR's Science Friday, 12/9/03
 - Time, 2/9/04
- FRC site/Dave Watson
 - ORNL Environmental S&T Showcase, August 2003
- NABIR/Derek Lovely, Craig Criddle
 - San Francisco Chronicle, July 2003





Opportunities

- To support the success of the largest environmental cleanup ever attempted
- To “revolutionize” environmental studies—bringing much-needed rigor and the new tools of genomics, nanoscience, and computing to bear.
- To provide knowledge relevant to a broad set of problems (e.g. water quality, future energy options, waste minimization, mining and industrial wastes)
- *To lead in developing an understanding of the relationships between microorganisms and geochemistry*

A background image showing a conceptual post-remediation plan map. The map displays a landscape with various colored zones and lines, representing different areas and boundaries. The text "Conceptual Post Remediation Plan" is overlaid at the bottom of the map.

Conceptual Post Remediation Plan



Thank you

